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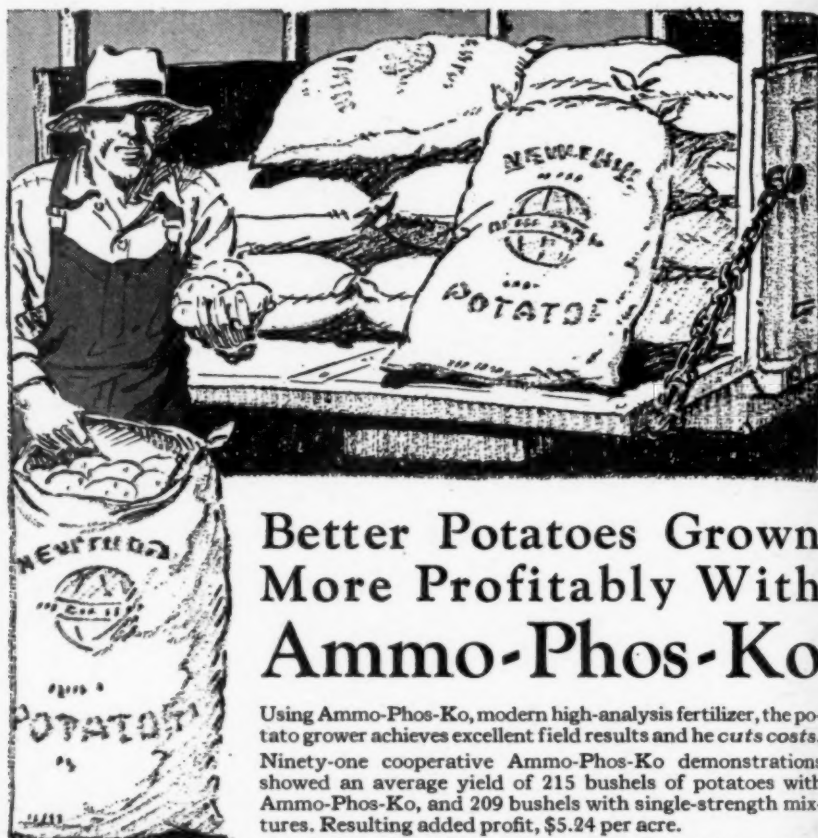
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## AMERICAN POTATO JOURNAL

PUBLISHED BY

THE POTATO ASSOCIATION OF AMERICA

EAST LANSING, MICHIGAN

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## Lime and Fertilizers for Potatoes

DEVELOPMENT OF SOIL PRACTICES THAT WOULD PERMIT POTATO  
GROWERS TO SOLVE THE SCAB PROBLEM. A SYSTEMATIC  
STUDY FROM THE VIEWPOINT OF SOIL  
ACIDITY. THE USE OF SULPHUR

By J. G. LIPMAN,

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For many years the attitude of our potato growers toward lime was a purely negative one. Having once recognized that the use of lime, wood ashes and of other materials exerting an action in the soil similar to that of lime encourages the development of scab on potatoes, they were, naturally, determined to keep out of trouble as well as they could. At the beginning of the present century many of the growers depended on the American Giant on account of its relative resistance to potato scab. But the day of the American Giant was rapidly passing. Something had to be done to offset the extensive losses caused by scab.

The work of Halstead at the New Jersey Station and Wheeler at the Rhode Island Station demonstrated in the middle 90's that potato scab could be largely controlled by maintaining an acid condition in the soil. Experimental and laboratory methods had not, however, reached a point where the most exact measurement of soil acidity was practicable. The promise was there, nevertheless, that further research would point the way toward the development of soil practices that would

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permit the growers to solve the scab problem with satisfaction to themselves. At the same time, they knew that soil acidity, while more or less effective for keeping down damage by scab, created other troublesome problems. Without the use of lime, at least occasionally, difficulty was experienced in the growing of clover and of other legumes. The soil became less mellow and more difficult to work up into a satisfactory seed bed. Beyond a certain point, the yields per acre grew less, even though the tubers were clean. Here again there was need for more definite information.

### SOIL ACIDITY

In order to meet the pressing needs of our growers, the New Jersey Experiment Station undertook, after 1915, an extensive and systematic study of potato scab from the point of view of soil acidity and of other soil conditions. The use of sulphur was put on a practical basis. The bacteria responsible for changing sulphur into sulphuric acid, and thereby increasing soil acidity, were carefully investigated, new species discovered and the conditions affecting their activities determined. It was shown that under some conditions, there was distinct advantage in using sulphur inoculated with these organisms for the more effective control of potato scab. The action of different fertilizers, particularly of ammonium salts, was investigated, also from the point of view of soil acidity and the control of scab. Similarly, a study was made of soil moisture, soil temperature, soil organic matter, and the distribution of chemical fertilizers and sulphur as factors in the prevalence of the potato scab organism and the damage done by it. Definite information thus became available for the growers, and the scab problem as such was more or less effectively solved.

In recent years potato growers in this and other states have been made to feel that the treatment which they give to their soils may not only cause a change in their chemical character, but that such changes are progressive and that constant vigilance is necessary for maintaining what the biologist would call *optimum* conditions—that is, conditions best suited for the production of their crop, or crops. Indeed, the soil acidity question is a serious problem not alone for the potato grower, but also for the producer of tree fruits, sweet potatoes, tomatoes, various grasses and ornamental plants. The apple growers in New Jersey are confronted by a lime problem partly because sulphur sprays and dusts employed by them have hastened the removal of lime and the accumulation of acidity. Cotton growers in the south, sweet potato growers in the Middle Atlantic states and corn growers in the Mississippi valley are being forced to give more and more thought to declining



yields in areas where soil acidity has become more pronounced. The potato crop is no exception to this, for, as has been shown by William H. Martin in this state, excessive acidity has already made its appearance in various fields where sulphur, salts of ammonia, potash fertilizers and other materials have speeded up the removal of lime from the soil.

### THE LIME PROBLEM

Since different forms of lime are the most economical and satisfactory means for correcting soil acidity, the lime problem is not a local one any more than soil acidity is a local problem. In some countries it is now a very pressing problem. For instance, Schurig, one of the leading German agronomists, claims that the lime problem in Germany is one of the major—if not the major—economic question in German agriculture. In 1928 the increased consumption over the preceding year was about 100,000 tons of ground limestone and 60,000 tons of burned lime. But this increase in consumption is still very much short of the amounts required to put the soils in that country in the best growing condition. The lack of lime is being increasingly felt in the corn belt soils in the United States. The same may be said to be true of tobacco and cotton, where root rots and other injury caused by soil fungi is becoming more prevalent. The agronomy department of the New Jersey station has demonstrated that, even in the case of creeping bent grasses used for lawns and putting greens, the use of acid-producing fertilizers has already created excessive soil acidity to the detriment of these grasses.

From the potato grower's standpoint, lime is important, not merely because it affects yields, but also quality. A number of German investigators report that the use of lime on acid soils increases the yield and leads to the production of tubers with a higher percentage of starch. The color and cooking qualities of these were improved. Schurig, who was already quoted, says that he prefers to use 500 to 600 pounds per acre annually rather than larger amounts at less frequent intervals. He and others claim that, when lime is applied between the middle of May and the first of June over the potato field when the plants are about four inches high, damage from scab is not evident. On the other hand, there is a much improved growth. They admit, however, that this practice results in the appearance of scab in the following year if potatoes are grown on the same field. However, one should bear in mind the fact that in European countries potato scab is much less troublesome than it is in the eastern United States. It may be noted, further, that the effect of lime as it relates to potato scab will vary with the season and soil type. On heavier soils a given

quantity of lime would be less likely to encourage the development of scab than it would on lighter soils. This is more or less true of certain sweet potato diseases. Bulletin No. 311, recently published by the Maryland station, contains, among other references, one which has to do with the effect of lime on sweet potatoes. The author says:

"The sweet potato is fairly tolerant to acid conditions, and excess lime lowers the quality of the roots. On the other hand, with extremely acid soil conditions, and particularly in soil rather low in plant nutrients, lime increases the yield."

### RESULTS IN GERMANY

It may not be out of place to mention here some interesting results reported by Martmann in a German publication recently published in Berlin. He states that in a loamy soil with a pH of 7, the starch content of potatoes was increased from 18.2 per cent where no lime was applied to 21.6 per cent where burned lime was used. In another soil, which was also a loamy sand, with a pH of 6.5, the starch content was similarly increased from 16.2 to 17.2, and in a third soil, with a pH of 4.5, the starch content was increased from 16.6 to 18.4. He found, further, that the tubers with a higher starch content contained a smaller percentage of water and a higher nitrogen content. He believes also that the potatoes from the limed plats had a tougher skin and the flesh was more firm.

### LARGE CROPS OF CLEAN TUBERS

But, let us not allow our enthusiasm for lime to run away with us. It is still the object of the grower to produce large crops of clean tubers. Lime is one of the means to this end. If it is needed and desirable, let us use it. For practical purposes let us remember that we have simple chemical tests that will show us whether there is excessive acidity in our soil or whether the acidity should be increased in keeping with our needs. Let us remember that we must maintain a sufficient supply of vegetable matter in the soil in order that a deep and mellow seed bed, favorable for the activities of bacteria and for desirable chemical changes, may be established and maintained. We shall have to depend on green manures and sods for furnishing the vegetable matter. Insofar as lime is a factor in improving the texture and structure of the soil and in favoring the circulation of air and water, let us use it accordingly. Let us remember, further, that there is objection to excessive amounts of lime not only because of possible damage to the crop by potato scab, but also because excessive amounts of lime interfere with the formation of

enough soluble iron and manganese in the soil to permit the best functioning of the potato foliage. When chemical tests show that our soil has become excessively acid, let us obtain sound advice concerning the kinds and amounts of lime to use and the method and time of application. It should be emphasized here again that the soil type, the season and the character of the fertilizer employed will materially influence the liming practices for the potato crop.

### FERTILIZERS IN POTATO GROWING

We now turn to the other part of our subject, namely the use of commercial fertilizers in potato growing. To use a word very popular with many technical men, the fertilizer industry is in a *dynamic* condition. It is, in other words, in a state of flux and change, just as the chemical and biological forces in our soils are. Methods for producing nitrogen fertilizers are constantly being improved. The competition in the fertilizer industry has become, if anything, more keen. As a result of the improved processes in production and the keener competition in merchandizing, commercial fertilizers are now much cheaper than they were a few years ago despite the higher costs of labor, materials and transportation.

By way of illustration, we may refer to the 373 brands of mixed fertilizers sold in New Jersey in 1929. It is reported by C. S. Cathcart, our state chemist, that the average of these brands was guaranteed to contain 3.36 per cent of nitrogen, 8.43 per cent of phosphoric acid and 6.14 per cent of potash. The amounts found were 3.37 per cent of nitrogen, 8.58 per cent of phosphoric acid and 6.27 per cent of potash. In other words, the amounts found were slightly greater than those guaranteed. By way of further comparison, let us note the following figures:

	Nitrogen	Phosphoric Acid	Potash	Selling Price Per Ton
1920 -----	2.35	8.38	3.86	\$63.10
1929 -----	3.37	8.58	6.27	36.32

We find that the average of the mixed fertilizers sold in New Jersey in 1929 contained about 1 per cent more nitrogen and nearly 2.5 per cent more potash than did the average of the mixed fertilizer sold in 1920. Despite that, the selling price was nearly \$27.00 per ton less. To understand fully what has happened, let us consider that in 1928-29 there were produced a total of 2,113,000 tons of chemical nitrogen as against 1,057,500 tons in 1923-24. In other words, the output of manufactured nitrogen has doubled in five years. This increase is largely attributable to the increased manufacture of sulphate

of ammonia, cyanamid, nitrate of lime and of other air-nitrogen products. There has been an increased production in several European countries, particularly Germany, England, Italy and France. There has also been marked increase in production in the United States. With the increased production have come falling prices, of which our farmers are the beneficiaries.

### NEW FERTILIZERS

Aside from the increased production of air-nitrogen materials and their consumption in agriculture, there has also been the development of new forms of nitrogen fertilizers and the appearance in the market of increasing quantities of so-called concentrated fertilizers, that is, mixtures carrying a larger number of units of actual plant food per ton of fertilizer. A number of our experiment stations and the United States Department of Agriculture have been carrying on experiments with these so-called concentrated fertilizers. There are several recent publications on the subject which furnish information and food for thought. Bulletin No. 266 of the North Carolina Experiment Station, entitled "Effects of Synthetic Nitrogen and Concentrated Fertilizers on Cotton and Sweet Potatoes," contains, among others, the following statement:

"While the concentrated mixtures did not give altogether as good yields as ordinary commercial fertilizers, most of the concentrated fertilizers used gave good results, but further study is required before their general use can be recommended for sweet potatoes on soils of this character. Experiments with other nitrogenous materials have shown that for best results with sweet potatoes on these sandy soils synthetic nitrogen salts as well as mineral nitrogen salts should be used in conjunction with organic nitrogen materials. It has been considered advisable, and experimental data have shown, that the nitrogen in a four per cent ammonia fertilizer should be derived one-third to one-sixth from organic materials such as dried blood, fish scrap, tankage or cottonseed meal."

### INVESTIGATIONS IN MAINE

Bulletin No. 350 of the Maine Experiment Station, entitled "Concentrated Fertilizers for Potatoes in Aroostook County," records investigations carried on co-operatively by that station and the Bureau of Chemistry and Soils of the United States Department of Agriculture. It would not be amiss to quote one or two of the conclusions reached by the authors. They say:

"The field studies were made principally to determine the value of new concentrated fertilizer mixtures as compared

with ordinary strength materials that have been more or less standard. The concentration of the mixtures varied considerably, but ranged as a rule from double to triple concentration. Rates of application were such that equivalent amounts of plant food were applied in all comparisons. The variety of potatoes was either Irish Cobbler or Green Mountain, the two most widely grown varieties in this district. Most of the work was done on typical Caribou loam soil."

The authors conclude that: "Uniformly good results were obtained with concentrated fertilizers when compared with ordinary strength fertilizers. A large share of this favorable response was no doubt due to the type of soil and to ample, well-distributed rainfall. The Caribou loam possesses a relatively high water-holding capacity and this, together with sufficient rainfall, is in a large measure a guarantee against fertilizer injury. It is evident, therefore, that the use of such fertilizers under Aroostook County conditions is well justified provided the fertilizer mixture possesses a good physical condition so that it can be drilled uniformly and can, furthermore, be well mixed with the soil before the seed pieces are planted."

The mixtures used in these tests consisted of a 5-8-7, a 10-16-14 and a 15-24-21. Applications of 1,000 pounds of a 10-16-14 gave as satisfactory results as an application of 2,000 pounds of a 5-8-7 mixture. Some difficulty was experienced in distributing the 15-24-21 mixture.

The authors say: "It is likely that certain changes in some of the fertilizer distributors now in common use will be required before the more highly concentrated mixtures can be applied as uniformly and as satisfactorily as one of less concentration like the 10-16-14 mixture."

### CONCENTRATED FERTILIZERS FOR POTATOES

By way of general conclusion, we may note that work with concentrated fertilizers for potatoes, carried on by the Bureau of Chemistry and Soils of the United States Department of Agriculture in co-operation with the States of Maine, New Jersey, Pennsylvania, New York and Virginia—as well as similar experiments carried on elsewhere—indicate a large future usefulness for the more concentrated forms of commercial fertilizers. Nevertheless, it should be borne in mind that disappointing returns from such fertilizers have occurred and will occur until we learn to use them correctly on particular soils and under particular climatic conditions.

For one thing, it has been shown that the different constitu-



ents of such concentrated fertilizers produce more or less definite results. We know that ammonium chloride—one of these constituents—cannot be used safely in large amounts and particularly on acid, sandy soils. We know, in a general way, that the high proportion of nitrogen derived from ammonium salts in such mixtures will call for the careful watching of soil conditions. We know, too, that nitrate of potash, used in some of these fertilizers, will give good returns under most conditions; that urea, another possible constituent of such mixtures, may be used effectively, and that still other constituents can be used with profit if the soil conditions are properly understood and satisfactory mechanical condition secured. Emphasis should be laid here again on the significance of soil acidity and its changing nature where salts of ammonia and potash are employed in increasing amounts.

### POTASH REQUIREMENTS

Potato growers are at all times compelled to study carefully the potash requirements of their crop. At the present time they are inclined to attach more importance to the proportion of potash in the fertilizer mixture than to the total amount applied. It is evident that 1,000 pounds of a 5-8-6 mixture will supply less potash to the soil than 2,000 pounds of a 5-8-4 mixture. We should, therefore, pay due attention to the amount of actual potash applied for any given quantity of a particular fertilizer mixture. Where yields of 250 bushels, or more, are expected, it would be wise to apply a minimum of 100 pounds of actual potash per acre. With still larger yields, it might be profitable to use still larger amounts.

We can well understand why potato growers in Germany should use large amounts of potash. The country is the leading producer of potash fertilizers in the world, and such fertilizers are cheap in Germany. There is a very strong and effective propaganda carried on among the farmers in behalf of the more generous use of potash. However, after various incidental facts are discounted, we still find that potato yields in different regions in Germany bear a more or less direct relation to the amounts of potash employed. Applications of 150 pounds, or more, of actual potash per acre are quite common. This will correspond to the use of 2,000 pounds per acre of a mixture containing about 7.5 per cent of actual potash. The yields for the entire country average about 200 bushels of potatoes per acre. Many growers obtain consistently 300 to 400 bushels per acre. Under such conditions, it is not difficult to understand why many of the growers prefer to apply an equivalent of one ton per acre of a mixture containing 10 per cent of potash.

A great deal is being said to the potato growers in various European countries concerning the superiority of sulphate of potash to muriate of potash as a source of this ingredient. Under the conditions and practices prevailing in the United States, muriate of potash seems to have given as good results as sulphate of potash. Since the former is considerably cheaper than the latter, the growers are quite right in not using sulphate of potash. It is claimed that where the latter is employed there is a better quality of tuber produced. They are more mealy and have a better flavor and color. In some of the propaganda literature issued in England it is claimed that sulphate of potash has been definitely established as the best potash fertilizer for yield and quality together. This statement to the contrary, we are not yet ready to recommend that in the United States preference be given to sulphate as a source of potash for potatoes.

### RELATION BETWEEN POTASH AND LIME

There seems to be an interesting relation between potash and lime in the soil. Where there is a greater supply of available lime, less potash is taken up by the crop. It has also been found that where potash is supplied in abundance, some of it is taken up in the early stages of growth and the crop is fortified, as it were, against less favorable growing conditions that may develop later on. Hence, this so-called "luxury consumption" of potash may have its definite advantages. Much is also being said by different experimenters in this and other countries about the relation of the potash supply to disease resistance. We are all familiar with the claim that a lack of potash may lead to more damage by wilt, blight, black leg and perhaps other potato diseases.

### EXPERIMENTS IN COLORADO

In this connection, it might be well to bear in mind that increased damage due to disease may be ascribed more to an excessive supply of available nitrogen than to an insufficient supply of potash. An interesting light is thrown on this point by experiments in Colorado in which it has been shown that excessive amounts of nitrates in the soil damage the crop by encouraging undue growth of vines and depressing the yield of tubers. Furthermore, where such excessive amounts of nitrates existed in the soil, the quality of the tubers was inferior both as to appearance, taste and cooking qualities. Hence, attention should be paid to luxury consumption of nitrogen as well as to luxury consumption of other fertilizer ingredients. This relation is influenced by the total supply of different ingredients as well as by their ratios to one another.

## SPACING OF PLANTS

Furthermore, the spacing of the plants may also have a bearing here. Extensive and interesting experiments carried on by Prof. Mitscherlich, in Prussia, indicate that the best results were obtained, under the soil and climatic conditions prevailing in that region, when the spacing was 16 to 20 inches, although in some cases a spacing of 16 to 24 inches gave the highest returns in bushels per acre.

## INFORMATION OBTAINED IS PROGRESSIVE

In conclusion, it may be observed that our information concerning the use of chemical fertilizers for the growing of potatoes is progressive. The number of fertilizer experiments with potatoes is increasing from year to year. States, where formerly commercial fertilizers were not used for the growing of potatoes, are now recognizing the economic importance of fertilizers and are carrying on experimental work to ascertain how they may be best used under their particular conditions. They learn from us as we learn from them, and the net result is a gain in knowledge and a more skilled use of this knowledge toward better yields and better quality.

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## Improving Market Quality in Potatoes\*

E. V. HARDENBURG, Cornell University, Ithaca, N. Y.

Potato growers in the East have been reminded often during the past few years of the importance of marketing better quality potatoes in order to withstand the steadily increasing competition with western growers. A considerable proportion of eastern growers consistently produce and market potatoes of better quality than that of the minimum requirement of U. S. No. 1 grade. These growers are able to do this because they use only good potato soil, practice proper cultural methods, effectively control diseases and insects, handle the tubers carefully, and grade properly. The fault lies with that great majority of growers who either do not have suitable potato-growing conditions or do not practice proper methods. It is fairly easy for a producer who has ideal soil free from stone and tuber insects to market a high quality product. But where

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\*Market Growers' Journal, October 1, 1930.

this situation does not prevail, we find that even the most careful job of grading can not make U. S. No. 1 grade out of cull potatoes.

Better market quality begins with choice of good soil and good seed and ends with proper grading and packing. We must produce better quality before we can capitalize on it in market returns.

### CULTURAL FACTORS AFFECTING QUALITY

Much of the crop is still grown on grass or grass and clover sod which is naturally infested with grubs, wireworms, millipedes and other soil-inhabiting insects which attack the potato tuber. Many growers, from both habit and training, rotate potatoes with other field crops over every field on the farm. Yet it is not uncommon to find farms on which there are only one or two fields adapted to potato growing. The tuber insect control problem has become so acute and our losses from these pests so great, that many growers are now forced to consider whether to change the potato rotation practice or go out of the potato business entirely. One or the other alternative seems necessary. For many years, growers in the Atlantic Seaboard states from Florida to Long Island have profitably produced potatoes of well-known quality on land either continuously or alternately cropped. There seems to be no good reason why many growers should not take potatoes out of the regular rotation and confine production to those soils and those fields known to produce the best quality.

### BETTER SEED

Better seed is one of the principal and perhaps the most fundamental means to obtain both the yields and the quality we desire. A survey of about 1,000 growers in an important potato region of one of the eastern states in 1928 and 1929 showed that less than 20 per cent of these planted improved seed. The best seed is cheap, at even 1930 prices. Too many growers neglect seed quality and at the same time give due attention to such factors as fertilizer, seed treatment, and spraying. This is false economy in that maximum returns can not possibly be realized on these latter investments if poor seed resulted in poor, uneven and weak stands of plants at the outset. Apparently, no grower can afford to plant less than 18 bushels of seed per acre and many are today planting 20 to 25 bushels. Spacing the hills as close as 12 inches in the row with rows 32 to 34 inches apart results in not only better stands and larger yields, but also more uniform-sized tubers, fewer oversized tubers, and less hollow-heart.

Seed treatment and greensprouting are both of universal value in reducing losses from rhizoctonia injury to the newly developed sprouts of the young plant. The direct effect here is in a reduction of the number of malformed and small worthless tubers. Deeper planting and a low, broad ridge gradually formed by proper tillage early in the growing season are recommended as a means of reducing sunburn injury. Spraying or dusting at least six times during the growing season with plenty of material and three nozzles to the row is almost a necessity in all sections of New York to insure sound healthy tubers, free from dry rot and the soft rot caused by secondary infection of bacteria.

### HARVEST METHODS IMPORTANT

Last fall many potatoes when harvested were very immature because of the early killing frost. Immature, in fact newly harvested, tubers are high in water content, thin skinned and hence very subject to skinning, bruising, and cracking. In our usual rough handling methods used in harvesting and storing potatoes, the stored crop last fall was in many instances less fancy in appearance than usual. Bruised, cut, and skinned potatoes, according to experimental tests, shrink from water loss much more than sound potatoes. From the standpoint of shrinkage in storage as well as better market quality, it would pay well to use more care to prevent tuber injury. Reports show that over 400 potato diggers were padded with garden hose, burlap, and automobile tires in Maine last year. Growers in other regions might well profit from this example. We might avoid some tuber injury by allowing the newly dug tubers to lie on the ground two or three hours until the skin has had time to dry and set. Labor hired to assist in the harvest might well be instructed not to throw tubers into the common sharp-edged slatted crates and to dump the tubers more carefully into the storage bin. Some growers are abandoning the slatted crate and substituting the half-bushel splint basket. In their opinion, picking into these baskets and dumping into bags, results in less tuber injury.

### SIZING VERSUS GRADING

Obviously, some growers have assumed that the principal factor in grading potatoes is the removal of small tubers. As between sizing and the removal of defective tubers, the latter is by far the more important. According to the definition, "U. S. No. 1 shall consist of potatoes of similar varietal characteristics which are not badly misshapen, which are free from freezing injury and soft rot, and from damage caused by dirt or other foreign matter, sunburn, second growth, growth



cracks, hollow-heart, cuts, scab, blight, dry rot, diseases, insects, or mechanical or other means." Here, then, is the standard by which market quality of our potatoes should be gauged. The key words in the definition are "damage caused by" and any defects more than skin deep and involving waste to the consumer in preparing for the table automatically rules a tuber out of the U. S. No. 1 grade. It is not by any means a fancy grade, but any lot of potatoes badly effected with wireworm holes requires the utmost care in grading if, indeed, it is worth grading at all.

Varieties of the White Rural or Russet Rural class should be sized over a 1 7-8 inch diameter screen, while varieties of the Green Mountain class (long varieties) may be sized over a 1 3-4 inch screen. U. S. standards set no maximum limit on size. Nevertheless, many growers find it advantageous to remove all extremely large, rough tubers and either use these at home or market them as a separate grade. A recent check-up among several hundred growers indicates that the majority of these are attempting to grade in some form or other. The real need is first, to produce a quality product and second, to grade it properly.

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## Maine Padded Digger Campaign in Aroostook County

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VERNE C. BEVERLY, Presque Isle, Me.

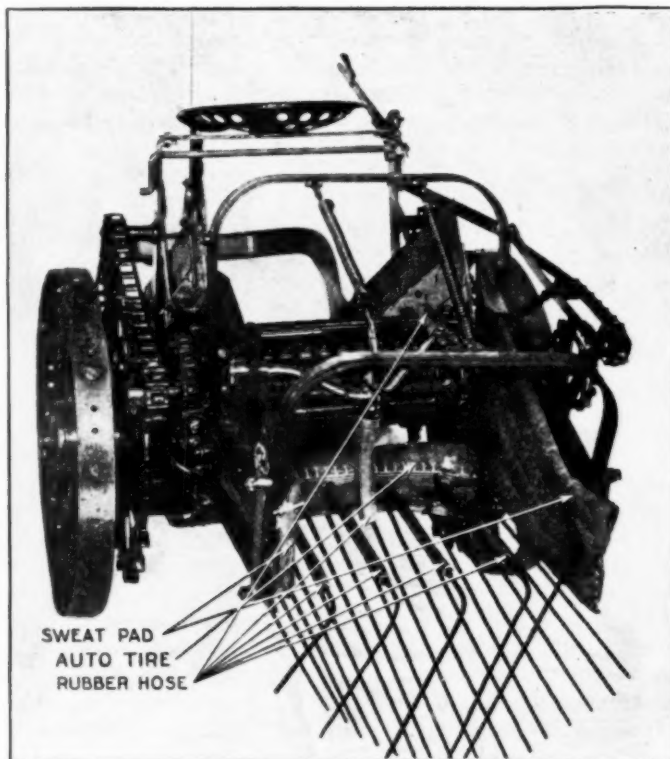
The Improved Digger Campaign put on in Aroostook county, Maine, the past two years by the Farm Bureau and Extension Service has secured excellent result as measured by the number of farmers who have enrolled in the campaign.

The purpose of padding is obvious. It protects the potatoes when they hit the rear rack head, sides, tines, and kickers. It improves the quality of potatoes. There are less cuts and bruises. Years when the price is low and the rack is severe this is a single big item. Then again, there is more chance for rot to get a foothold if the skin of the potato is broken.

Material needed can usually be found around the farm. Four pieces of  $\frac{3}{4}$ -inch rubber hose 15 inches long, two pieces of 1-inch rubber hose eight inches long, and an old sweat pad or similar material, and one old tire.

The sweat pad is placed along the side on the rear of the

machine. It may be necessary with some machines to drill two holes and attach the pad by means of stove bolts. The bolt that holds one of the rear tines may be removed, a longer one used, thus making it unnecessary to drill a hole at this point. Three bolts should hold the pad in place. The tire should be cut to fit the rear rack head. It should be cut so that it will fit snugly and wired on each end. This will keep it firmly in place.



The four pieces of  $\frac{3}{4}$ -inch hose are slipped on over four large tines. This may be accomplished easily by turning a little oil in the hose before slipping it on. The remaining two pieces of hose are put on the kickers. The digger is now padded in a very satisfactory manner.

Previous to last year the campaign was called a Padded Digger Campaign, but last fall a continuous elevator digger made its appearance in Aroostook. This new type of digger gained favor and many farmers were quick to adopt it. The continuous elevator digger carries the potatoes to the rear of the digger, dropping them onto the ground. Agitators help

to give the necessary separation of dirt. This machine digs potatoes with very little bruising and so the Farm Bureau adopted an Improved Digger Campaign this year, urging either the padding of the old type digger, or the adoption of the continuous elevator type of digger. The farmers who have adopted the latter type are loud in their praise of it, but it will be a matter of a few years before this type of digger will completely displace the old rear end digger in Aroostook.

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## Crop and Market News

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(Contribution from Bureau of Agricultural Economics)

The dullness, which has characterized the potato market for several months, was still noticeable in mid-November. Trading was draggy, prices were low, and shipments decreasing. Holdings in most of the important producing sections was largely in the hands of growers. Not much improvement was expected in the situation before the beginning of the new year. Shipping-point prices lately have been scarcely more than half what they were a year ago. A cold wave, which was developing in the west about November 15, was expected to affect the marketing situation to some extent.

The potato crop is now estimated at 368,444,000 bushels. This is nearly 5% above the forecast of October and about 2% above the crop of 359,796,000 bushels harvested last year, but still 6% below the average production during the previous five years. The improvement in prospects since October is particularly marked from Maine to Illinois, in western Nebraska and in the irrigated section of the west. In the Dakotas and parts of Minnesota the gain from the unusually late growing season was offset by freeze losses the middle of October. The average quality of the potato crop is the lowest since the drought of 1901, and the estimate of production includes a considerable quantity of small and unmerchantable potatoes. Per capita production for the United States is increased only slightly to about 3 bushels, which is quite moderate.

Although shipments recently have been heavier than those of the corresponding weeks in 1929, movement had decreased by mid-November to a daily average of 600 cars, of which Maine, Idaho and the north central area supplied the greater part. Total forwardings to the 15th from the leading late-crop states were about 71,950 cars, compared with 77,520 the year before and a total of 187,590 cars all of last season.

States exceeding considerably their corresponding movement for the early part of last season are California, Colorado, Idaho, the Long Island section of New York, and Wyoming. States showing decided shortages in carlot movement, compared with the 1929 figures, include Maine, Michigan, Minnesota, western New York, North Dakota, Pennsylvania, South Dakota, Washington and Wisconsin. An exceptionally large crop was produced in Idaho this year and some local estimates indicate a possible output of 30,000 cars from that state. About 8,500 cars had been shipped by mid-November, or more than half the entire Idaho total for the 1929-30 season.

In an effort to stabilize the potato industry in the Pacific Northwest, a committee has been organized there, similar to the Interstate Early Potato committee of the Southeast. This new organization is known as the Pacific Northwest Potato Committee, and the object is to evolve a regional plan for teaching potato growers and dealers how to use properly the economic information available to them. Sub-committees on acreage, finance and marketing have already been appointed in the state of Washington, and other states were expected to be completely organized at an early date.

Western New York points had declined to an f.o.b. level of \$1.45 per 100 pounds on sacked round whites, with northern Maine shippers getting only \$1.15-\$1.20 on Green Mountains. The f.o.b. range in north central states was \$1.20-\$1.50, and western shipping sections reported sales at 80c-\$1.15 per 100 pounds. Yakima Valley of Washington was down to \$20 per ton of combination-grade Russet Burbanks.

Green Mountains were jobbing in city markets at \$1.60-\$2.15, while eastern round whites brought \$1.55-\$1.75 per 100 pounds. Carlot sales of round whites from the north central area were made in Chicago mostly at \$1.25-\$1.45, with a few Nebraska Triumphs at \$1.60, and Idaho Burbanks at \$1.65-\$1.75. Idaho arrivals in Chicago have been very heavy, exceeding those from any other state. Colorado potatoes brought \$1.70-\$1.85 in that market.

Early potato states in the South are together planning an 11% increase in acreage over that of 1930, so that any shortage of old stock may be compensated by a good crop of new potatoes next spring. Florida, however, expects to make a 10% decrease from plantings of last season. Commercial plantings in 12 early states together may total 191,360 acres. In 1925 these states had 127,160 acres and plantings were gradually increased until a peak of 216,430 acres was reached in 1928. The next year (1929) plantings were sharply reduced to 135,660 acres.

## Tabb Potato Service, Chicago, Ill, Nov. 20, 1930

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Western markets are steadier today after being partially demoralized in Chicago yesterday and the general sentiment seems to be that prices are low enough. Maine quotations have been reasonably firm for several days at unchanged prices from last week. About 70% of the potatoes arriving in Chicago are from Idaho and Colorado and considering the high freight rates from these states it hardly seems that the far western growers will continue crowding the markets at either present or lower levels this early in the season. The cooler weather now approaching should also stimulate the demand to some extent. No particular improvement is expected in the near future but more stable markets should prevail.

The Long Island shipments are dropping off in the east. Prince Edward Island consignments are being discouraged, and the loading in Maine is being governed by actual demand, all of which is enabling the large eastern markets to clear up in fairly good shape. No particular improvement is expected during the next two or three weeks but the eastern situation seems on a sounder basis than at any time during the season.

In the west the Idaho shipments and arrivals are and will continue dominating the situation. During the last nine business days, Nov. 10 to 19 inclusive, the Chicago potato arrivals totalled 1,187 cars, of which 655 cars were Idahos, 194 cars Colorados and only 338 cars from all other states combined. When it comes to the unloads in the city, the percentage in favor of Idaho and Colorado is still more impressive. This leaves the market situation in what is usually termed the "key market" of the country almost entirely in the hands of the Idaho and Colorado shippers and growers, particularly Idaho.

The most unusual feature for Chicago is that somewhere between 60% and 70% of the Idahos arriving here are No. 2 Russets and for the first time in our recollection Chicago is becoming largely a No. 2 potato market. Idaho No. 2's sold here yesterday for as low as \$1.10 cwt., which returned the Idaho shipper practically nothing at all after freight charges, brokerage, shrinkage, sacks, sorting and loading charges are deducted. In fact there is very little left for the Idaho grower for his potatoes even at today's No. 2 price of \$1.25 to \$1.35-40. It seems certain therefore that these No. 2 Idahos which the bulk of Chicago trade is buying, and which hundreds of pedlars are distributing all over the city, cannot decline any lower and



still be attractive enough for the shippers to continue moving them.

The situation is about the same with the U. S. No. 1 Idaho Russets which are selling here at mostly from \$1.65 to \$1.75. The freight, brokerage and shrinkage from Idaho to Chicago runs from 85c to 90c which only leaves the Idaho shipper from 75c to 85c f.o.b. if he gets the top here. Further it costs him 20c per cwt., for his sack, sorting charges and loading expenses and deducting all of these leave the Idaho grower only 60c for his potatoes and still no one has made a profit. Under these conditions it seems that markets should be at least on bottom for some time to come, but on any 25c per cwt. advance or more the Idaho shipments would again become burdensome and soon over-supply available markets.

The Idaho cash track prices today are ranging from 90c to \$1.00 cwt. f.o.b. on U. S. No. 1 Russets and mostly around 60c on U. S. No. 2, but both are too high for any of the middle western markets unless we get an improvement soon at this end. A grave question is developing in the minds of many operators as to whether or not the Idaho policy of shipping everything in the shape of a potato, clipped ends and all, as either No. 1's or No. 2's is not working out as a detriment to the industry in the state this season. Idaho Russets have been ranging in price in Chicago this week from \$1.10 to \$1.90 and as before mentioned the trade is turning very heavily to the No. 2 grades. It is becoming very difficult to get any substantial premium for U. S. No. 1 Russets when so many No. 2's are available, and in fact Colorado McClures are averaging higher in Chicago than Idaho Russets. The southwestern states such as Oklahoma, Texas and others have generally refused for several years to pay the usual premium for U. S. No. 1 Russets, and now it seems that the Chicago trade is being educated in the same direction. The big shortage in the northern states has given Idaho the opportunity of marketing these poor grade Russets in this territory this season but this opportunity may easily prove to be a boomerang that will reflect to the disadvantage of the Idaho potato industry for years and years to come.

The movement in the northern states is very light and Minnesota, North Dakota, Wisconsin and Michigan combined only shipped 57 cars yesterday compared with Idahos 120 and Maines 156. Local shippers are mostly trying to buy at 80c per cwt., bulk in Wisconsin today and proportionately in other northern states, but hauling is exceptionally light, as the growers are not inclined to sell for less than \$1.00.

The Chicago market is generally steady with trading fair at \$1.40 to \$1.60 on Wisconsin whites, \$1.30 to \$1.40 on Minne-

sota and North Dakota Cobblers, \$1.40 to \$1.50 on Red River Ohios, \$1.65 to \$1.75 on U. S. No. 1 Idaho Russets with a few fancy cars selling up to \$1.80-1.90. No. 2 Idahos are quoted today at from \$1.25 to \$1.40 while Colorado Red McClures are selling from \$1.70 to \$1.85. The arrivals this morning were light at 75 cars and track holdings totalled 432 cars which should drop off from day to day unless the market starts improving.

Over in Maine the demand is still limited but the market is steady with a firm undertone at mostly \$1.15-1.20 sacked per cwt., f. o. b. usual terms on Green Mountains, while the dealers are paying the growers from \$1.50 to \$1.60 per barrel measure bulk, with hauling very light. The track holdings in Boston, New York and Philadelphia are moderate and the latter was a trifle stronger on eastern potatoes yesterday. New York, however, continues dull with trading slow at from \$2.50 to \$2.75 on ten peck bags of Maine Green Mountains and about the same on the Long Islands.

Regarding consumption it is too early in the season for us to get a very close line on it and all calculations are more or less of a guess. Judging from the almost utter absence of speculation during the last six or eight weeks we are all inclined to the opinion that a greater percentage of the October shipments went into consumption than in any recent season with the possible exception of 1928, as all reports indicate almost no storage holdings in any of the large markets and distributors tell us that the small town demand in the deficiency states was generally speaking the lightest for years. With these facts or suppositions in mind it seems that the number of cars unloaded in such cities as Chicago compared with previous seasons should be of some value. We are giving below the official figures for Chicago, New York and St. Louis which are all we have so far:

	CHICAGO			NEW YORK			ST. LOUIS		
	1930	1929	1928	1930	1929	1928	1930	1929	1928
August .....	1280	1354	1451	1175	1344	1289	145	333	149
September .....	1550	1505	1457	1486	1980	1603	417	382	149
October .....	1885	1694	1989	1683	2366	1901	599	619	238
	4715	4553	4897	4344	5690	4793	1161	1334	536

Due to the fact that few, if any, potatoes are trucked into Chicago, it should show the truest picture. Regarding New York, the small carlot unloads this season are accounted for by the unusually heavy trucking from Long Island this season

as compared with last year when the Long Island crop was cut so short by drouth and by the eastern speculative buying of Maine potatoes last September and October, which has been entirely absent this fall. At any rate these figures indicate consumption fully as great as last season and Chicago looks like between 5% and 10% increase. We have incomplete reports, however, that the Southern States are not so far buying as heavily as last year due to poor economic conditions down there brought about by the cheap prices for cotton. This decrease in southern buying may also be due to the heavier fall crop of potatoes in these states. The Texas fall crop which is the only one estimated separately shows a production of 245,000 bushels compared with only 51,000 bushels last year. Until these fall crops are consumed they will naturally take the place of northern grown potatoes.

With reference to the excess shrinkage this season due to the poorer quality of the crop as compared with last season we believe this will show up in the carlot shipments of such states as Maine, Upstate New York, Pennsylvania, Michigan, Wisconsin, Minnesota and North Dakota in particular. Nebraska and Idaho will also shrink considerably from the freezing injury in the part of the crop that was caught. Advices from Idaho today indicate that potatoes dug around Idaho Falls after the freeze are running around 50% No. 1's, 25% No. 2's and the remainder waste.

Regarding Maine, practically the entire crop was shipped last season, pickouts and all, due to the good prices prevailing. This season all of the pickouts are going to the starch factories, which are running at full blast where they were practically idle last season. Maine is not expected to ship near as large a percentage of the total production this season unless the markets improve very considerably.

In all of the drouth stricken states there are a great many thousands of bushels of small, misshapen and second growth potatoes that may or may not move. Our present theory is that unless and until prices improve very materially there will be little or no demand for these small, misshapen No. 2's at a price that will be attractive to the growers. The reason that Idaho No. 2's are in such heavy demand in the Chicago territory and elsewhere is that they have size, and in fact they usually carry a large percentage of bakers which are effected only by growth cracks or a clipped end. The large restaurants in Chicago that specialize on Idaho baked potatoes are picking their stock almost entirely from No. 2's.

Should the 19 late surplus states ship the same percentage of their production this season as last, approximately 191,000

cars could be expected compared with 187,590 in 1929-30, but for the reasons given above and the further fact that shipping point prices are averaging only about one-half of what they were a year ago, the total should be less. The shipments to date from these states are nearly 5,000 cars (72,863 against 77,372) behind last season to this date, but this is due to the light October shipments this fall and this extra 5,000 cars were in storage at the receiving end a year ago. Considering the short crops and short storage supplies in the deficiency states at present the daily and monthly carlot shipments should soon start gaining on those of last season. We are still of the opinion that the future course of prices depends largely upon the course of general commodity price levels and business conditions outside of the potato industry itself.

—TABB POTATO SERVICE.

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## Notes

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### IDAHO

#### *Report, September and October, 1930 Pacific Northwest Potato Committee*

The secretary of the Pacific Northwest Potato Committee started work September 15. The headquarters and office for the work was established with the Agricultural Extension Service in the State House at Boise, Idaho.

Most of the time since September 15 the secretary has been traveling through the potato districts getting acquainted with county agricultural agents, leading dealers and farmers. Mr. Wells A. Sherman, in charge, Fruit and Vegetable Division, Bureau of Agricultural Economics, U. S. D. A., and Mr. A. E. Mercker, Secretary of the Interstate Early Potato Committee in the Southeast accompanied Mr. Dorbish on this initial trip and assisted in establishing the work and acquainting him with the actual operations of the Interstate Potato Committee in the Southeast.

Conferences were held with representatives of the official agencies of the State Universities, in Idaho at Moscow, in Washington at Pullman and in Oregon at Corvallis, when the general plans of procedure were discussed.

Meetings were held with dealer groups in Seattle, Washington, and Portland, Oregon. At these meetings the purposes of the Pacific Northwest Potato Committee were outlined and co-operation in the project invited.

In Yakima a meeting was called of representatives of producers, shippers, bankers, railroad men and state and federal officials concerned with the potato industry. Mr. Mercker and Mr. Sherman told of the work of the Interstate Potato Committee in the southeast and suggested a probable program for the work in the Northwest. Prospective candidates for state sub-committees on acreage, credit and finance and marketing were discussed and the fitness of each man for the job was frankly considered. In some instances prominent men were mentioned for places on the committees but were finally turned down because the question was raised whether they would actively participate in the work of the committee. The serious thought given to the selection of these committees and the fair analysis given each member considered, augurs well for the future success of these committees in the State of Washington.

It was agreed that each committee should have a membership of not less than nine and not more than fifteen, excluding the secretary of the committee and the secretary of the Pacific Northwest Committee who is a member of all committees. The minimum number was selected at this meeting, leaving room for additions later as the need developed. Mr. W. D. Dodds presided as chairman of the meeting.

A ten-day trip was made through the potato districts of Southern Idaho by Sherman, Mercker and Drobish. Some of the points visited were Caldwell, Wilder, Twin Falls, Buhl, Burley, Filer, Firth, Idaho Falls, Blackfoot, Jerome, Kimberly, Rexburg, Rigby, Shelley, Rupert, Ashton, St. Anthony and Pocatello. As many shippers and producers were visited as it was possible to reach in the time available. Some conferences were held with small groups and at Idaho Falls a meeting of all those interested in the potato industry was held in the Court House.

The candidates for Idaho State sub-committees are still under consideration and will be announced later.

A seed show in Ashton, Idaho, and the Annual Shelly Potato Show were attended and contacts made with seed producers and others engaged in the potato business in that part of the state. Seed growers reported good inquiry for seed for 1931 planting and some sales had already been made at \$3.00 per cwt. for certified seed potatoes.

The Secretary, H. E. Drobish, spoke before well attended joint meetings of County Key Bankers and County Agricultural Agents in Spokane and Seattle, Washington, and presented the objects of the work of the Pacific Northwest Potato Committee. The assistance and co-operation of the banker and county agent groups were invited in furthering the work of this committee.



Oregon, while not a member of the Pacific Northwest Potato Committee, has signified a great deal of interest in the work, and desires the secretary to speak at a series of meetings in the state before the next planting season. Lack of finances prevented their joining in as a co-operating state in the project, but the college has included in the 1931-32 budget an item for the inclusion of Oregon in the work. A request has been made for funds to be made immediately available to cover the expenses of the secretary for a possible series of meetings in Oregon.

The secretary accepted an invitation from Director Paul Maris of Oregon Agricultural Extension Service to speak before the annual meeting of the Oregon Potato Association held on October 31 at the International Livestock Exposition in Portland. Following the talk, the meeting unanimously passed a resolution approving the plan of the Pacific Northwest Potato Committee and requesting that an appropriation be made in Oregon to provide for this state to join in the co-operative project.

The Director of Extension in Nevada has requested further information relative to this co-operative project and advises that Nevada is interested in the possibility of becoming one of the states co-operating in this potato project.

The secretary, during November, will appear on the programs of the following meetings:

Nov. 13—Annual Idaho State Seed Show, Nampa, Idaho.

Nov. 15—Potato Dealers' Banquet, Pocatello, Idaho.

Nov. 20—Lions Club, Spokane, Wash.

Nov. 20—Potato Growers' Conference, Spokane, Wash.

Montana has requested a visit from the secretary on February 4th and 5th when the Montana Potato Growers' Association and the Seed Growers' Association hold their meetings in Bozeman in connection with the Annual Farm and Home Week.

H. E. DROBISH, *Secretary.*

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## MAINE

In Maine the potato crop is expected to total 45,120,000 bushels. This outlook is 2% more than expected a month ago and 17% above the five-year average production but 10% less than harvested last year in spite of a 5% increase in the acreage planted to this crop in Maine. Outside of northern and central Aroostook county the yield is generally high and the quality excellent.

C. D. STEVENS,  
G. BURMEISTER,  
Statisticians.

### WYOMING

The unusually heavy rainfall of August was extremely beneficial to the dry land potato grower of this state. Yields of certified seed are averaging close to two hundred or more bushels per acre field run.

The average for 1930 represents a decrease of 30% over that of last year. The certified crop will however be considerably higher than that of last season.

With regard to diseases, the cooler weather of late August and early September was very favorable for the recognition of the mosaic diseases. This has aided considerably in eliminating a few seed stocks and in checking foundation stock under field conditions.

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### MINNESOTA

Although the season of 1930 has been a rather discouraging one to the potato growers of Minnesota from the standpoint of production, the Arrowhead Potato Show and State 4-H Potato Growing contest held at Biwabik on October 23, 24 and 25 gave the impression that we have had one of the best potato growing years in the history of the state. Most of the potatoes exhibited were grown in the Arrowhead district which comprises the northeast section of Minnesota, but some very excellent lots were shown from other sections of the state.

One hundred and forty-six individual entries consisting of peck and bushel samples comprised the open class. In the 4-H Club class 97 lots were entered.

The Irish Cobbler, Bliss Triumph, Green Mountain, and Rural New Yorker varieties predominated, although the Early Ohios (largely from the Red River Valley section) and Russet Burbanks were well represented. On the whole, the quality of the potatoes displayed was excellent, and indicated that in the regions from which the samples came, growing conditions had not been as adverse as in some parts of the state. The competition in every class was keen and the judging of the different entries commanded a great deal of interest among exhibitors.

Most of the potato fields in the Arrowhead section are not very large but the spud is important to the farmers of the region as a cash crop. The entire area is particularly well adapted to potato culture and the quality is always good. Inasmuch as most of the potatoes grown in the region are disposed of in the Range towns and Duluth, buyers from outside the state and dealers operating in the Twin Cities have given

little or no attention to it. With the development of facilities for handling potatoes at loading stations and the production of potatoes in a large commercial way the entire region should command the attention of buyers interested in buying high quality potatoes. Shows such as the one recently held at Biwabik serve as a stimulus to everyone interested in the production of this crop. This was forcibly brought out by the large attendance of farmers and the eagerness displayed by them for the latest information on potato problems.

Throughout the county, American Legion posts are fostering different types of enterprises which aim toward a better community spirit and community pride. The Biwabik American Legion is playing an important part in the agricultural development of the Range territory and has been largely responsible for the growing of better potatoes in that particular locality. Several years ago the American Legion of Biwabik was responsible for importing a carload of the best certified Irish Cobblers, produced in Minnesota, which was distributed among growers of the locality.

The results of this action have been far reaching and the satisfaction obtained by the growers of this stock has also been a source of satisfaction to the Legion post. In sponsoring the Arrowhead Potato Show the Biwabik American Legion, together with the Biwabik Commercial club and the Lakeland Farmers' club, took a leading part and their efforts are surely bearing fruit. The splendid co-operation between these organizations is doing its share in stimulating interest in the agricultural possibilities of the entire Arrowhead country.

—A. G. TOLAAS.

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### VERMONT

The total acreage entered for certification in Vermont was 744. Of this, 435 were certified. About three-quarters of these were Green Mountains and the remainder Irish Cobblers. Leaf roll and mosaic accounted for a large part of the rejection. These diseases were particularly virulent in the southern part of the state. In the cooler sections particularly Orleans county a number of fields were found of extremely fine records, so far as disease is concerned, and an exceptionally high yield. The season in Vermont was particularly favorable to crops, and heavy yields have prevailed throughout. A number of growers report more than 500 bushels per acre and many others got better than 400 bushels per acre. It is probable that the general average for 435 acres certified would be not less than 325. The extra long growing season allowed the potatoes to ripen and there has consequently been less than usual of bruising

and jamming so that a fine grade is being put up. The market, however, at time of writing is very weak. A dollar and twenty-five cents appears to be about the going price per bushel for certified seed. Only those growers who have no storage facilities or are in immediate need of funds are selling at that price.

The centralized seed plot in which was planted a sample of each line of seed entered for certification worked out very satisfactorily. The plot was planted on the farm of Inspector A. L. Stone at Williamstown. About a hundred samples were planted, each consisting of 100 tubers. The readings of the samples check on the whole very accurately with the readings in the field.

—HAROLD L. BAILEY.

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## Review of Recent Literature

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*Remington, Roe E., F. Barton Culp, and Harry von Kolnitz.*

The potato as an index of iodine distribution. *Journ. Amer. Chem. Soc.* 51:2942-2947, 1 fig., 1929.

It has been found that different vegetables vary in the percentage content of iodine and that the percentage present in a given vegetable varies with the locality in which it is grown. The authors have found that the percentage of iodine in potatoes grown in South Carolina increased from 180 parts per billion, dry basis, in soils within 50 miles of the sea to 266 parts per billion in soils 200 miles from the sea. The red clay soils of the Piedmont region of South Carolina produced potatoes with an average iodine content of 249 parts per billion as compared with 191 in potatoes grown in the Sand Hills, 164 in the Lower Pine Belt, and 198 in the Coastal Regions. The average iodine content of 211 p. p. b. in potatoes grown in South Carolina is compared with that of 195 in potatoes grown in Maine, of 110 in Idaho, of 97 in Michigan, and of 86 in Minnesota.

It is suggested by the authors that the disintegration of granite rocks supplies the principal source of the iodine and that this is supplemented by the use of commercial fertilizers, particularly Chilean nitrate, which may carry as high as 0.02 per cent of iodine. Only a very narrow belt along the coast is influenced in iodine content by the sea.

—M. F. BARRUS.

## Program of the Seventeenth Annual Meeting of the Potato Association of America

December 30 and 31, 1930

ROOM 23, MAIN BUILDING, WESTERN RESERVE UNIVERSITY  
Cleveland, Ohio

### Tuesday Morning Session, December 30, 9:30 A. M.

1. President's Address—Impressions of Potato Investigations and Potato Production in England (30 min.) (lantern)—John Bushnell, Agricultural Experiment Station, Wooster, Ohio.
2. Report of the Secretary-Treasurer (15 min.)—H. C. Moore, East Lansing, Michigan.
3. Appointment of Committees (10 min.)
4. Report of the Seed Potato Certification Committee (15 min.)—W. H. Martin, Agricultural Experiment Station, New Brunswick, New Jersey.
5. Potato Prices and Acreage Stability (20 min.) (lantern)—L. H. Bean, Bureau of Agricultural Economics, U. S. D. A., Washington, D. C.
6. A Discussion of Second Growth in Potatoes (15 min.) (lantern)—C. L. Fitch, Agricultural Experiment Station, Ames, Iowa.
7. The Relationship of Tillage and Potato Yields (15 min.)—O. W. Sjogren, Killifer Manufacturing Corp., Los Angeles, California.

### Tuesday Afternoon Session, December 30, 1:30 P. M.

8. Influence of Soil Reaction on the Development of the Potato and *Actinomyces scabies* (15 min.)—W. H. Martin, Agricultural Experiment Station, New Brunswick, New Jersey.
9. Transmission of Spindle Tuber of Potatoes Through the Usual Commercial Practices (10 min.)—L. O. Gratz, University of Florida, Quincy, Florida.
10. Effect of Overheating on Sprouting, Rotting and Sprout Tuber Formation in Potatoes (15 min.) (lantern)—Freeman Weiss, W. M. Peacock, R. C. Wright, U. S. Department of Agriculture, Washington, D. C.
11. Cultivation Experiments with Potatoes (15 min.)—H. C. Thompson and P. H. Wessels, Cornell University, Ithaca, New York.
12. Some Results with High-Analysis Fertilizers on Potatoes (15 min.)—Firman E. Bear, American Cyanamid Company, New York.
13. Potato Strain Testing on a Regional Basis (15 min.)—E. V. Hardenburg, Cornell University, Ithaca, New York.
14. The Effect of Greening on the Set and Yield of Potato Seed Tubers (10 min.)—K. C. Westover, West Virginia University, Morgantown, West Virginia.
15. Results from Greening Russet Rural Seed Potatoes (12 min.) (lantern)—John Bushnell, Agricultural Experiment Station, Wooster, Ohio.

### Wednesday Morning Session, December 31, 9:30 A. M.

16. A Summary of Recent Research Studies in Genetics and Breeding of the Potato (15 min.)—F. A. Krantz, University of Minnesota, St. Paul, Minnesota.



17. Some Distinct Tuber-line Strains in Triumph Potatoes: a preliminary report (15 min.)—H. O. Werner, University of Nebraska, Lincoln, Nebraska.
18. Comparison of Healthy Green Mountain Strains and Tuber-lines in Maine (15 min.) (lantern)—Donald Folsom, Agricultural Experiment Station, Orono, Maine.
19. The Value of Inbreeding in the Potato (*Solanum tuberosum*) (30 min.) (lantern)—F. A. Krantz, University of Minnesota, St. Paul, Minnesota.
20. Studies of Mutation in the Potato (15 min.)—Charles F. Clark, U. S. Department of Agriculture, Washington, D. C.
21. A Numbering and Recording System for Potato Breeding (15 min.)—R. M. Bailey and F. A. Krantz, University of Minnesota, St. Paul, Minnesota.
22. Studies with Dust Treatments of Cut Potato Seed (15 min.)—E. E. Clayton, Long Island Vegetable Research Farm, Riverhead, New York.

### Wednesday Afternoon Session, December 31, 1:30 P. M.

23. Reports of Committees and Election of Officers (30 min.)
24. Potato Dusting and Spraying Experiments in New Brunswick from 1925-1930 (15 min.)—D. J. MacLeod, Dominion Experimental Farm, Fredericton, New Brunswick.
25. The Shrinkage Factor in Stored Potatoes (15 min.)—Ora Smith and A. L. Wilson, Cornell University, Ithaca, New York.
26. Sun-scald Injury of Potatoes as Influenced by Solar and Sky Radiation and Storage Temperatures (20 min.) (lantern)—Walter M. Peacock, R. C. Wright, T. M. Whiteman, Bureau of Plant Industry, U. S. D. A., Washington, D. C.
27. The Successful Growing of Potatoes in Dry Weather (15 min.) (lantern)—E. B. Tussing, Ohio State University, Columbus, Ohio.
28. Dry Land Versus Irrigated Potatoes for Seed Purposes (15 min.)—F. M. Harrington, University of Montana, Bozeman, Montana.
29. Some Spraying Results Under 1930 Conditions (15 min.)—Daniel Dean, Nichols, N. Y.

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### HOTEL ACCOMMODATIONS AT CLEVELAND

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According to advance information, headquarters for all societies meeting with the A. A. S. will be at the Hotel Hollenden or Statler. These are large hotels with metropolitan rates. With a view of finding first-class accommodations at somewhat lower rates, I inquired about some of the smaller hotels. As a result of this inquiry I recommend the Hotel Auditorium, opposite the Cleveland Auditorium, at East Sixth and St. Clair Avenue. The management claims it is the newest hotel in Cleveland. All rooms have bath. The quoted rates are: Single, \$2.00, \$2.50, \$3.00; double, \$3.50, \$4.00; twin beds, \$4.50, \$5.00.

The Hotel Auditorium is in the downtown district, two short blocks from the Hotel Hollenden, four blocks from Euclid Avenue, where street cars are obtained for the University, and less than a mile from the Union Railway Terminal.

Members are advised to make reservations by writing directly to the hotel. The Potato Association does not undertake to arrange hotel accommodations for members attending the Annual Meeting.

—PRESIDENT BUSHNELL.

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